What is claimed is:

1. A magnetic recording medium comprising a soft magnetic back layer which is formed of a soft magnetic material; an underlayer; and a recording layer which is formed directly on the underlayer, which is composed of an alloy magnetic material mainly composed of CoPtCr containing oxygen, and which has residual magnetization in a direction perpendicular to a film surface larger than residual magnetization in an in-plane direction of the film surface; the soft magnetic back layer, the underlayer, and the recording layer being formed in this order on a non-magnetic substrate; wherein the underlayer is formed of an alloy mainly composed of CoCrRu.

2. The magnetic recording medium according to claim 1, wherein each of the recording layer and the underlayer has a hexagonal close-packed structure.

3. The magnetic recording medium according to claim 1, wherein a rocking curve half value width of a (002) peak in X-ray diffraction of CoPtCr having a hexagonal close-packed structure of the recording layer is not more than 8 degrees.

4. The magnetic recording medium according to claim

1, wherein the underlayer has a film thickness of 5 to 20 nm.

5. The magnetic recording medium according to claim 1, wherein the underlayer is a single layer.

6. The magnetic recording medium according to claim 1, wherein a distance between the soft magnetic back layer and the recording layer is not more than 40 nm.

7. The magnetic recording medium according to claim 1, wherein the recording layer has a thickness of not more than 20 nm.

8. The magnetic recording medium according to claim 1, wherein Co is contained by 1 to 65 at. % in the underlayer.

9. The magnetic recording medium according to claim 1, wherein an oxygen content of the recording layer is 5 to 20 at. %.

10. The magnetic recording medium according to claim 1, wherein Si or Mg is contained by 3 to 15 at. % in the recording layer.

11. A magnetic recording apparatus having a magnetic recording medium comprising, on a non-magnetic substrate, a soft magnetic back layer which is formed of a soft magnetic material, an underlayer, and a recording layer which is formed directly on the underlayer; the magnetic recording apparatus comprising a magnetic head and a drive unit which drives the magnetic recording medium relatively with respect to the magnetic head; wherein the recording layer is formed of an alloy magnetic material mainly composed of CoPtCr containing oxygen, residual magnetization in the recording layer in the direction perpendicular to the film surface is larger than residual magnetization in the in-plane direction of the film surface, and the underlayer is formed of an alloy mainly composed of CoCrRu.

12. The magnetic recording apparatus according to claim 11, wherein the magnetic head applies magnetization in a direction perpendicular to a film surface of the recording layer and applies magnetization in a direction parallel to a film surface of the soft magnetic back layer to constitute a magnetic circuit in cooperation with the recording layer and the soft magnetic back layer.